



Forest Health Protection

Pacific Southwest Region



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To: District Ranger, Truckee Ranger District, Tahoe National Forest

Subject: Using a brush masticator to prune conifers infested with dwarf mistletoe
(FHP Report NE06-09)

At the request of Jerry Kent, Truckee Ranger District forester, Danny Cluck, Forest Health Protection (FHP) entomologist, and Bill Woodruff, FHP plant pathologist, conducted a field evaluation on July 6, 2006. We evaluated an eastside pine stand (Jeffrey pine (estimated 90%), white fir (9%) and sugar pine) which was treated in 2005 with a mechanized brush masticator. The masticator was used to grind brush, slash and small damaged or diseased trees which remained after an earlier commercial thinning project. Many of the small Jeffrey pine trees removed during the mastication treatment were infected with western dwarf mistletoe, *Arceuthobium campylopodium*, which spread from dwarf mistletoe plants growing mostly in lower crowns of nearby overstory Jeffrey pine. In addition to grinding understory vegetation, the masticator was used to grind the lower branches from the residual conifers. The removed branches were infected with various amounts of dwarf mistletoe. Figures 1-2 show the Caterpillar excavator with masticator head which was used to masticate/prune the branches in this project and Figure 3 shows Jeffery pine after treatment. The purpose of this evaluation is to identify any pathological or entomological problems associated with this method of pruning and to determine if the treatment will improve the health of the pruned trees.



Figure 1. Caterpillar excavator with masticator head.



Figure 2. Pruning pine branches with masticator.

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Background

Dwarf mistletoes are parasitic plants which grow on conifers throughout the world. They reduce the growth, vigor, seed production and wood quality of infected trees. Dwarf mistletoe spreads by discharging tiny seeds into ballistic flight to a host tree where, if successful, one sticks to a needle of a host tree with the help of a sticky seed coating. When seasonal precipitation washes the seed to the base of the needle, it germinates and grows through the bark into the branch. In the branch it grows root-like structures into the cambium and xylem and removes water and nutrients. Branches infected with dwarf mistletoe often grow erratically, with frequent forking and swelling. In time, this growth can produce large round clumps of branches and foliage called witches' brooms that use a significant amount of a tree's water and nutrients and reduces growth. A light dwarf mistletoe infestation generally does not reduce tree growth. However, a heavy infestation can stress the host by robbing it of needed water and nutrients; thereby slowing growth and predisposing it to bark beetle attack, especially during extended periods of below normal precipitation.

Levels of dwarf mistletoe infestation in a tree are traditionally quantified using the Hawksworth dwarf mistletoe rating (DMR) system. DMRs range from 0 to 6. An infected tree's DMR is determined by visually dividing the crown of the tree horizontally into thirds. Each third is assigned a value of "1" if less than half of its branches are infected and a value of "2" if more than half of its branches are infected. The values for the three sections of the crown are summed to determine the tree's DMR. Western dwarf mistletoe (*A. campylopodium*) can significantly reduce a Jeffrey pine tree's growth when the DMR is 4 or greater.

Discussion

Two silvicultural practices used to control or manage dwarf mistletoe infestations in are tree removal and pruning. When the management objective is wood production, tree removal is often preferred when a tree is heavily infested with dwarf mistletoe (DMR equal to 4, 5 or 6) since it is growing slowly and is more susceptible to bark beetle attack.



Figure 3. Jeffrey pine trees after masticator pruning.

Dwarf mistletoe pruning is costly and generally used only for high value trees (ie. those in campgrounds or administrative sites). Pruning dwarf mistletoe brooms and infested branches from a conifer is done to reduce the severity of the infestation and increase the growth and vigor of the tree. Pruning is most successful on trees with DMRs of 1 or 2 but can also be successful on trees with a DMR of 3 and maybe even 4. Effective pruning reduces a tree's DMR which increases tree growth. The masticator pruning being evaluated here removed the lower infected branches up approximately 30 feet on the bole resulting in an average live crown ratio of 40 to 60 percent after pruning.

The commercial thinning treatment which preceded the mastication pruning removed the heavily infected Jeffrey pine trees from this stand (ie. DMR 4, 5 and 6). The mastication pruning then removed the infected branches from the lower 25-30 feet of the remaining trees. It appears that the average DMR of the large Jeffrey pine in the stand was reduced from a DMR 2 to a DMR 0.5 with the mastication pruning treatment. By reducing the average DMR by 1.5, the pruning with a masticator has set back the dwarf mistletoe in this stand approximately 15 years (based on a general rule-of-thumb estimating that dwarf mistletoe intensifies at a rate of one DMR rating/decade). Since the residual large Jeffrey pine in this stand have good live crown ratios and are widely spaced, they should be able to grow in height faster than the dwarf mistletoe can spread vertically up their crowns. Because the residual dwarf mistletoe is growing near the base of the canopy and trees are widely spaced, tree-to-tree spread by shooting seed is unlikely.

The overall appearance of this stand, following the mastication of ground fuels and lower tree branches, is good. In addition to a much lower DMR, the residual trees have a wider spacing and the average crown base height has increased. Future prescribed fire treatments and wild fires can now be more easily managed as a result of this treatment without killing large numbers of trees. Moreover, fire may help maintain a low DMR in this stand by killing residual and latent dwarf mistletoe infected branches in the lower canopy.

Almost no bark beetle problems were observed following the mastication pruning. This may be due to favorable precipitation and soil moisture. In a drier year, the numerous broken-ended branch stubs created by this treatment might attract bark and engraver beetles and result in a significant amount of tree mortality. Avoid masticator pruning during prolonged periods of below normal precipitation when the trees are stressed, as unacceptable insect caused mortality may result. When possible, schedule masticator pruning in the fall after the peak bark beetle flights.

Another consequence of this treatment (creating numerous broken-ended branch stubs) is that it creates many infection courts for heart rot fungi to enter the branches and possibly the boles. However, the broken and split branch ends will hasten the drying of the branches and reduce the time the exposed wood is receptive to fungal spore inoculation. To minimize the possibility of infecting the bole with heart rot, schedule masticator pruning during dry weather.

Conclusion

This treatment looks promising from a forest health prospective. Ground and ladder fuels have been significantly reduced. The average DMR of the stand appears to have been reduced by approximately 1.5. The trees are widely spaced which will minimize tree-to-tree

spread of root disease and dwarf mistletoe seed. Crown fires will not be easily sustained in this open stand. And last, but not least, the widely-spaced trees will not have to compete for limited soil moisture during extended dry periods and thus will be best suited to survive all but the most severe droughts.

Monitoring

The growth and health of this stand should be monitored to help assess the success of mastication pruning. For comparison, it would be useful to find a similar nearby dwarf mistletoe infected stand which was (or soon will be) thinned to a similar stocking without pruning the branches with a masticator. FHP will work with the Truckee RD and tag a number of sample trees pruned with the masticator for monitoring. The tagged trees will be evaluated to obtain baseline data for the following: tree height, DBH, live crown ratio, DMR, and stand basal area. In 7 to 10 years, the trees will be re-evaluated to determine how they are growing in comparison to Jeffery pine growing nearby; and whether they have been impacted by insects or diseases as a result of the treatments.

If you have any questions regarding this report and/or need additional information please contact Bill Woodruff at 530-252-6680 or Danny Cluck at 530-252-6431.

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